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GLOBAL REPLACE ~~71000A~~ WITH 71000
REPLACE ~~57000E~~ WITH 57000

2.1 DOCUMENTS

GLOBAL TO THIS SECTION: Change all Chg. abbreviations to Ch.

Document Number	Revision	Document Title
LS-71000	A B	Program Requirements Document for the Human Research Facility
NHB 6000.1	D D	Requirements for Packaging, Handling, and Transportation - Electronics Control Unit (ECU)
NSTS/ISS 13830	C, Ch. 4 Ch. 41	Payload Safety Review and Data Submittal Requirements for Payloads Using the Space Shuttle and International Space Shuttle
NSTS-1700.7	B, Ch. 14 Ch. 141	Safety Policy and Requirements For Payloads Using the Space Transportation System
NSTS-1700.7B ISS ADDENDUM	Ch. 54	Safety Policy and Requirements For Payloads Using the International Space Station
MIL-A-8625	9/93	Anodic Coatings for Aluminum and Aluminum Alloys
NASA-STD-6001	02/98	Flammability, Odor, Offgassing and Compatibility Requirements and Test Procedures for Materials in Environments that Support Combustion
NT-CWI-001	A Ch. 2 07/31/0 1	Task Performance Sheet (TPS)
SAIC-TN-9550	12/01	Ionizing Radiation Dose Estimates for International Space Station Alpha using the CADrays 3-D Mass Model

3.1.2.2 Power Interface Panel (PIP)

The Power Interface Panel (PIP) is a portable power interface between the MARES and either the UIP, SUP, or UOP. The box may be relocated in support of the MARES. **~~The maximum capacity of the PIP will be 120 Vdc at 10A.~~** The interface concept for the UIP/SUP, PIP, and MARES is shown in Figure 3.1.2.2-1.

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- 3.1.3.3 Standard Utility Panel/Utility Outlet Panel Power Interface
 Electrical power is supplied through ~~the either~~ the SUP connectors in the APM....
- 3.1.4.1 Launch/Landing Operation
 ...whether mounted to the HRF MARES Rack structure or stored in containers.
The launch mounting concept is shown in Figure 3.1.4.1-1.
- 3.1.4.2 On-Orbit Operation
 ...All MARES accessories will be deployed only when needed for operations.
The on-orbit stowage and deployment concepts are shown in Figures 3.1.4.2-1 and 3.1.4.2-2 respectively.
- 3.2.1 Functional Performance Characteristics
 - a. ~~HRF MARES Rack shall attach to existing ISS hardware without modification.~~
 - b. ~~HRF MARES Rack shall have minimal activities required to attach the MARES Main Box and VIF.~~
 - ae. HRF MARES Rack shall provide stowage capability for all MARES hardware.
 - d. ~~HRF MARES Rack shall provide a power interface to attach the MARES to either the UIP or the SUP/UOP.~~
- 3.2.2.2.1.2 On-Orbit Semi-Permanent Protrusions
 - A. Not applicable. **Rack Insertion Device (RID) plate requirement which is no longer valid.** ~~HRF MARES Rack contains no drawer handles.~~
- 3.2.3 Reliability, Quality and Non-Conformance Reporting
 - A. **Reliability is ensured by compliance with the applicable qualification and acceptance tests documented in section 3.4 and by compliance with the useful life requirement documented in section 3.2.3.2.** HRF hardware maintainability is ensured by compliance with the applicable ISS maintainability requirements derived from SSP 57000 and documented in section 3.0. ~~Reliability and maintainability requirements for HRF integrated rack hardware shall be as defined in LS 71026, Human Research Facility (HRF) Reliability Plan For The HRF Integrated Rack. [LS 71000A, Section 7.2]~~

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3.2.5.1.4	Additional Environmental Conditions
	The environmental information provided in Table 3.2.5.1.4-1, Environmental Conditions on ISS, and Figure 3.2.5.1.4-1, Operating Limits of the ISS Atmospheric Total Pressure, Nitrogen and Oxygen Partial Pressures , is for design and analysis purposes. [SSP 57000E, paragraph 3.9.3.4]
3.2.7.1.2.1	MPLM Interfaces
	A. HRF MARES Rack racks shall interface to the MPLM structural attach points in accordance with SSP 41017 Part 2, paragraph 3.1.1. [SSP 57000E, paragraph 3.1.1.2.A]
3.2.7.1.3	HRF MARES Rack Rack -Structure Requirements
	C. An HRF MARES Rack-racks requiring rotation shall use the rack and crew restraints identified in SSP 30257:004 (for example, the 14-inch fixed length tether and the 71-inch adjustable length tether) to secure the rack in these rotated positions for payload operations and maintenance. [SSP 57000E, paragraph 3.1.1.4.L]
3.2.7.2.10	Reverse Energy/Current
	...with characteristics specified in paragraphs 3.2.7.2.1-3.2.7.2.5 and 3.2.7.2.8 with a source impedance of 0.1 ohm. [SSP 57000E, paragraph 3.2.2.5]
3.2.7.2.12.1	Interface B
	A. The load impedance presented by the HRF MARES Rack to the Main Interface B shall not exceed the bounds defined by Figures 3.2.2.7.1-1 and 3.2.2.7.1-2 of SSP 57000 for input over the frequency range of 50 Hz to 100 kHz. The magnitude component of the HRF MARES Rack input impedance should not be less than the minimum defined in Figures 3.2.2.7.1-1 and 3.2.2.7.1-2 of SSP 57000. At frequencies where the magnitude component of the HRF MARES Rack input impedance is less than the defined minimum, the phase component of the input impedance shall not exceed the bounds defined in these Figures. [SSP 57000E, paragraph 3.2.2.7.1.A]
	B. The load impedance presented by the HRF MARES Rack to the 1.2 to 1.44 kW interface B shall not exceed...
3.2.7.9.3	Fire Suppression
	Each separate HRF rack and subrack equipment volume, which contains a

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potential fire source will require fire suppression capabilities. Determination of potential fire sources will be presented to and approved by the PSRP during the phased safety reviews. Safety fire suppression requirements are specified in NSTS 1700.7B, ISS Addendum, paragraph 220.10c. [SSP 57000, paragraph 3.10.3]

3.3.5.1 Electromagnetic Interference Susceptibility for Safety-Critical Circuits

~~Payload safety-critical circuits, as defined in SSP 30243, shall meet the margins defined in SSP 30243, paragraph 3.2.3. [SSP 57000E, paragraph 3.2.4.10]~~

Not applicable to HRF MARES Rack.

3.3.5.2.2 Safety-Critical Circuits Redundancy

~~EPCE shall meet the electrical safety requirements as defined in NSTS 1700.7 Addendum. The EPCE connected to either Interface B or Interface C shall meet the safety-critical circuits redundancy requirements defined in NSTS 18798. [SSP 57000E, paragraph 3.2.5.1.2]~~

Not applicable to HRF MARES Rack.

3.3.6.39 Winghead Fasteners

Winghead fasteners shall fold down and be retained flush with surfaces. [LS-71000, Section 6.4.4.4.8] ~~Not applicable to HRF MARES Rack~~

3.3.6.51.4 Handle and Grasp Area Design Requirements

3.3.6.51.4.1 Handles and Restraints

Not applicable to HRF MARES Rack.

3.3.6.51.4.2 Handle Location/Front Access

Handles and grasp areas shall be placed on the accessible surface consistent with the removal direction. [LS-71000, Section 6.4.6.4.2]

3.3.6.51.4.3 Handle Dimensions

Handles shall be designed in accordance with the minimum applicable dimensions in Figure 3.3.6.51.4.3-1[LS-71000, Section 6.4.6.4.3]

3.3.6.51.4.4 Non-Fixed Handles Design Requirements

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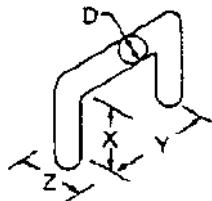
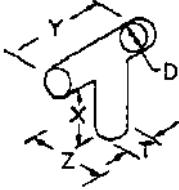
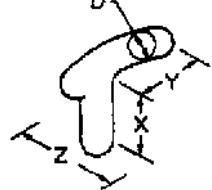
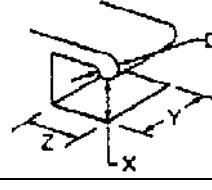
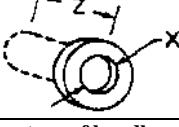
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Illustration	Type of handle	Dimensions in mm (in inches)		
		(Bare hand)		
		X	Y	Z
	Two-finger bar	32 (1-1/4)	65 (2-1/2)	75 (3)
	One-hand bar	48 (1-7/8)	111 (4-3/8)	75 (3)
	Two-hand bar	48 (1-7/8)	215 (8-1/2)	75 (3)
	T-bar	38 (1-1/2)	100 (4)	75 (3)
	J-bar	50 (2)	100 (4)	75 (3)
	Two-finger recess	32 (1-1/4)	65 (2-1/2)	75 (3)
	One-hand recess	50 (2)	110 (4-1/4)	90 (3-1/2)
	Finger-tip recess	19 (3/4)	—	13 (1/2)
	On-finger recess	32 (1-1/4)	—	50 (2)
Curvature of handle or edge (DOES NOT PRECLUDE USE OF OVAL HANDLES)	Weight of item	Minimum Diameter		
	up to 6.8 kg (up to 15 lbs)	D = 6 mm (1/4 in)	Gripping efficiency is best if finger can curl around handle or edge to any angle of 2/3 p rad (120°) or more	
	6.8 to 9.0 kg (15 to 20 lbs)	D = 13 mm (1/2 in)		
	9.0 to 18 kg (20 to 40 lbs)	D = 19 mm (3/4 in)		
	Over 18 kg (over 40 lbs)	D = 25 mm (1 in)		
	T-bar post	T = 13 mm (1/2 in)		

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Figure 3.3.6.51.4.3-1. Minimum IVA Handle Dimensions for IVA Applications

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3.3.6.52.2.2 Extractor -Type Fuse Holder

The design of the extractor-type fuse holder shall be such that the fuse is extracted when the cap is removed. [LS-71000, Section 6.4.9.1.2.2] ~~Not applicable to HRF MARES Rack.~~

3.3.8.1.4 Launch and Landing Loads

B. HRF MARES Rack ~~interfaces to the MPLM shall be capable of operation during and after exposure to~~ shall maintain positive margins of safety for the random vibration environment defined in Table 3.3.8.1.4-1. [SSP 57000E, paragraph 3.1.1.3E]

3.4.1 Thermal Environment Compatibility

A. HRF MARES Rack shall operate nominally during exposure ~~to 16 °C to 30 °C (61 °F to 86 °F)~~ to 17 °C to 28 °C (63 °F to 82 °F).

3.4.2 Vibration and Sine Sweep

~~HRF MARES Rack hardware shall meet the vibration and sine sweep requirements as described in 4.3.2.~~

- A. MARES Rack shall perform a sinusoidal resonance analysis.
- B. MARES Rack shall operate nominally following exposure to flight vibration loads in the launch configuration.
- C. The PIP shall operate nominally following vibration at workmanship loads.

3.4.3 Functional Acceptance

HRF MARES Rack shall complete a functional test as outlined in a Task Performance Sheet (TPS) or functional test plan. ~~HRF MARES Rack shall operate nominally under all planned modes of operation.~~ [LS-71000A, Section 5.4.1.3.4]

3.4.4 Electrical, Electronic and Electromechanical Parts Control, Selection and Burn-In

A. ~~Parts control shall be in accordance with SSP 30312, “Electrical, Electronic, and Electromechanical (EEE) and Mechanical Parts Management and Implementation Plan for Space Station Program.”~~

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B. ~~Parts selection for equipment shall be in accordance with:~~

1. ~~SSP 30423, “Space Station Approved Electrical, Electronic and Electromechanical (EEE) Parts List.”~~

2. ~~SSP 30512C, “Space Station Ionizing Radiation Design Environment.”~~

~~Where no alternative is available, nonmilitary parts, components and subassemblies may be used, but burn-in screening of these items shall be performed per 3.4.4C.~~

C. Burn-in screening shall be completed (100%) on all flight hardware (units).

4.0 VERIFICATION PROVISIONS

...Appendix B contains the applicability matrix for ISS Pressurized Payload Interface Requirements Document requirements. The verification ~~Data Sheet (VDS) addressing the appropriate method for ISS interface verification~~ is also contained in Appendix B. If an alternate verification method is desired, the new verification method must be negotiated in the **Interface Control Document. Unique Payload Verification Plan.**

~~Section 4.2 contains the verification methods for science functional acceptance.~~ Appendix C contains the applicability matrix for science functional requirements.

Section 4.3 contains the verification methods for program qualification and acceptance requirements. Appendix D contains the applicability matrices for acceptance and qualification requirements.

The responsibility for the performance of all verification activities is as specified in Appendices B, C and D. All testing described in Appendices B, C and D shall be documented via Task Performance Sheet (TPS) (JSC Form 1225) per JSC Work Instruction NT1-CWI-001. Except as otherwise specified in the contract, providers may use their own or any other facility suitable for the performance of the verification requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the verifications set forth in this specification.

4.2 RESERVED FUNCTIONAL PERFORMANCE ACCEPTANCE TESTING

~~The requirements herein describe specific test requirements for functional performance acceptance.~~

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4.3.2 Vibration Tests

~~An analysis shall be conducted which uses the referenced acceleration data and determines integrated rack structure loads via Finite Element Modeling (FEM). The analysis shall be considered successful when the FEM is approved by the ISS Program, and the model determines integrated rack structure loads that maintain positive margins of safety, based upon the rack structure allowables identified in Section 3.3.8.1.4.~~

Sinusoidal Resonance Survey analysis is described in Section 4.3.2.1. Qualification Vibration Analysis (QVA) is described in Section 4.3.2.2.1. Qualification for Acceptance Vibration Test levels are as described in Section 4.3.2.2.2. Acceptance Vibration Test levels are as described in Section 4.3.2.2.3.

4.3.2.1 Sinusoidal Resonance Analysis

The MARES Rack shall be analyzed to determine the fundamental resonance frequencies. [LS-71000, Section 5.4.1.1.2]

4.3.2.2 Random Vibration Test

Hardware subjected to vibration testing shall be functionally tested before and after vibration testing. Hardware expected to operate during launch shall be operating and functionally tested during vibration testing. The pass-fail criteria for the functional test and the definition of the functional test will be equipment unique and shall be defined in the test plan and test procedure for each element. [LS-71000, Section 5.4.1.1.3]

4.3.2.2.1 Qualification Vibration Analysis

QVA certifies the design for launch in the MPLM. The QVA requirement is identical to Section 3.3.8.1.4.A. [LS-71000, Section 5.4.1.1.3.1]

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4.3.2.2.2 Qualification for Acceptance Vibration Test

Qualification for Acceptance Vibration Testing (QAVT) determines the number of Acceptance Vibration Tests that may be run on flight units. QAVT shall be run on dedicated qualification test hardware only. The QAVT for HRF equipment shall be performed at a 7.93 g rms composite level over the frequency range and spectral density defined in Table 4.3.2.2.2-1. QAVT shall be conducted at 1.69 times the Acceptance Vibration Test levels. QAVT duration shall be the Acceptance Vibration Testing (AVT) duration multiplied by the number of AVTs for which the hardware is to be qualified. [LS-71000, Section 5.4.1.1.3.2]

Table 4.3.2.2.2-1. Qualification for Acceptance Vibration Test Levels

Frequency Range (Hz)	Minimum Power Spectral Density (g^2/Hz)
20	0.017
20 - 80	3 dB/Octave Slope
80 - 350	0.067
350 - 2000	-3 dB/Octave Slope
2000	0.0118
Composite	7.93 g rms

4.3.2.2.3 Acceptance Vibration Test

AVT is used to screen defects in workmanship that cannot be detected by inspection. AVT shall be performed at a 6.1 g rms composite level over the frequency range and minimum AVT levels defined in Table 4.3.2.2.3-1. Vibration duration shall be a minimum of 60 seconds in each of three axes. Functional/continuity tests shall be conducted on components before, during, and after the AVT. [LS-71000 Section 5.4.1.1.3.3]

Table 4.3.2.2.3-1. Acceptance Vibration Test Levels

Frequency Range (Hz)	Minimum Power Spectral Density (g^2/Hz)
20	0.01
20 - 80	+3 dB/Octave - Slope
80 - 350	0.04
350 - 2000	-3 dB/Octave - Slope
2000	0.007
Composite	6.1 g rms

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4.3.4 Electrical, Electronic and Electromechanical Parts **Control, Selection and** Burn-In

- A.** ~~Compliance with 3.4.4.A is considered successful when it can be shown via analysis that the parts control process is compliant with 3.4.4.A. [LS-71000A, Section 5.4.1.1.10]~~
- B.** ~~Compliance with 3.4.4.B is considered successful when an analysis is provided which includes a risk assessment, electrical stress analysis, and data delivery on information, such as designed/as built EEE parts, list, construction history, Government and Industry Data Exchange Program (GIDEP) Alerts, part obsolescence, radiation susceptibility, and/or prior history. [LS-71000A, Section 5.4.1.1.10]~~

C. The burn-in test may be accomplished at the component or assembly level, and is specified as:

- 72 hrs continuously at room ambient temperature while functioning. **During this test, two sets of 5 power cycles each shall be performed. Each set of 5 power cycles shall be completed within a period of 20 minutes. Power cycle timing shall allow sufficient time for the hardware and electronics to reach a steady-state before power to the hardware is restored following power-down.**
- 96 hrs continuously at a specified controlled temperature while functioning. **During this test, three sets of 5 power cycles each shall be performed. Each set of 5 power cycles shall be completed within a period of 20 minutes. Power cycle timing shall allow sufficient time for the hardware and electronics to reach a steady-state before power to the hardware is restored following power-down.**

Full functional tests shall be performed on the experiment hardware before and after the burn-in test. Controlled temperature is defined as 15 °C below the maximum rating of the device with the lowest temperature rating in the article under test. [LS-71000A, Section 5.4.1.1.10]

~~All flight assemblies utilizing non-military parts (as specified in Section 3.4.4) shall undergo burn-in testing. [LS-71000A, Section 5.4.1.1.10]~~

4.3.10 Electromagnetic Compatibility

The HRF MARES Rack shall comply with LS-71016A, HRF EMI/EMC Control Plan. [LS-71000A, Section 5.4.1.2.1]

5.2 Packing, Handling and Transportation

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A. Packaging, handling, and transportation shall be in accordance with applicable requirements of NHB 6000.1~~C~~ and referenced documents therein.
[LS-71000~~A~~, Section 9.2A]

5.4 Marking for Shipment

Interior and exterior containers shall be marked and labeled in accordance with NHB 6000.1~~C~~, including precautionary...shall be applied in accordance with NHB 6000.1~~C~~. [LS-71000~~A~~, Section 9.4]

5.5 NASA Critical Space Item Label

The NASA Critical Space Item Labels Form 1368 shall be affixed to exterior and interior shipping containers in accordance with NHB 6000.1~~C~~. [LS-71000~~A~~, Section 9.5A]

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APPENDIX B

**INTERNATIONAL SPACE STATION (ISS) PRESSURIZED PAYLOAD INTERFACE
REQUIREMENTS DOCUMENT VERIFICATION MATRIX**

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APPENDIX B

INTERNATIONAL SPACE STATION (ISS) PRESSURIZED PAYLOAD INTERFACE
REQUIREMENTS DOCUMENT VERIFICATION MATRIX

{If a request for deviation or waiver from the requirement stated in this HRD is anticipated or if the type of documentation supplied or method of verification is anticipated to not be as stated in this matrix, this information should be noted in the Comment column.}

HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.2.2.1		3.1.1.4A	Mass and Center of Gravity Properties	✓	See ICD	HRF	
3.2.2.2.2.1A	--	3.1.1.7A	On-Orbit Payload Protrusions - Lateral Extension	✓	See ICD	HRF	
3.2.2.2.2.1B	--	3.1.1.7B	On-Orbit Payload Protrusions - Attachment of RMA	✓	See ICD	HRF	
3.2.2.2.2.1.1	--	3.1.1.7.1	On-Orbit Permanent Protrusions	N/A			HRF MARES Rack has no permanent protrusions
3.2.2.2.2.1.2A	--	3.1.1.7.2A	On-Orbit Semi-Permanent Protrusions - SIR and ISIS Drawer Handles	N/A			No handles in HRF MARES Rack RID plate requirement which is no longer valid
3.2.2.2.2.1.2B	--	3.1.1.7.2B	On-Orbit Semi-Permanent Protrusions - Other	✓	See ICD	HRF	
3.2.2.2.2.1.2C	--	3.1.1.7.2C	On-Orbit Semi-Permanent Protrusions - Removable	✓	See ICD	HRF	
3.2.2.2.2.1.3A	--	3.1.1.7.3A	On-Orbit Temporary Protrusions - Envelope	✓	See ICD	HRF	
3.2.2.2.2.1.3B	--	3.1.1.7.3B	On-Orbit Temporary Protrusions - Removal	✓	See ICD	HRF	
3.2.2.2.2.1.4	--	3.1.1.7.4	On-Orbit Momentary Protrusions	N/A			HRF MARES Rack has no momentary protrusions

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

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HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.2.4A	6.4.4.2.6.3	3.12.4.2.8.4	Maintainability - Unique Tools	N/A			No unique tools to HRF MARES Rack
3.2.4B	6.4.4.3.1	3.12.4.3.1	Maintainability - One-handed Operation	✓	See ICD	HRF	
3.2.4C	6.4.4.3.2B	3.12.4.3.2A2	Maintainability - Connector Mate/Demate	✓	See ICD	HRF	
3.2.4D	6.4.4.3.2C	3.12.4.3.2B	Maintainability - No Damage to Wiring Connectors	✓	See ICD	HRF	
3.2.4E	6.4.4.2.6	3.12.4.2.8	Maintainability - Access to Hardware Items	✓	See ICD	HRF	
3.2.4F	6.4.3.1.2A	3.12.3.1.2A	Maintainability - Built-in Control	N/A			No fluids
3.2.4G	6.4.3.1.2B	3.12.3.1.2B	Maintainability - Access to Filters for Replacement/Cleaning	N/A			No capture elements
3.2.4.1.1	6.4.10	3.12.10	Payload In-flight Maintenance	✓	See ICD	HRF	
3.2.5.1.1.1	6.1.9.1.1	3.9.1.1	Pressure	✓	See ICD	HRF	
3.2.5.1.1.2	6.1.9.1.2	3.9.1.2	Temperature	✓	See ICD	HRF	
3.2.5.1.1.3	6.1.9.1.3	3.9.1.3	Humidity	N/A			No cold sources
3.2.5.1.2.1	6.1.9.2.1	3.9.2.1	Active Air Exchange	N/A			No active air exchange
3.2.5.1.2.2	6.1.9.2.2	3.9.2.2	Oxygen Consumption	N/A			No oxygen consuming equipment
3.2.5.1.2.3	6.1.9.2.3	3.9.2.3	Chemical Releases	✓	See ICD	HRF	HRF MARES Rack has no chemical releases
3.2.5.1.2.4	6.1.5.12	3.5.1.12	Cabin Air Heat Leak	✓	See ICD	HRF	
3.2.5.1.3.1	6.2.9.3.1	3.9.3.1	Instrument Contained or Generated Ionizing Radiation	✓	See ICD	HRF	No radioactive materials or radiation sources
3.2.5.1.3.3	6.1.9.3.3	3.9.3.3	Single Event Effect (SEE) Ionizing Radiation	✓	See ICD	HRF	
3.2.5.1.5A	6.1.1.4B	3.1.1.4B	Pressure Rate of Change - On-orbit	✓	See ICD	HRF	
3.2.5.1.5B	6.1.1.2B	3.1.1.2B	Pressure Rate of Change - MPLM	✓	See ICD	HRF	
3.2.5.1.5C	6.1.1.4H	3.1.1.4K	Pressure Rate of Change - PFE	N/A			HRF MARES Rack has no PFE port

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

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HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.2.5.1.5D		3.1.1.4M	Pressure Relief Device	N/A			No relief devices
3.2.5.2	6.4.3.3	3.12.3.3	Acoustic Emission Limits	N/A			HRF MARES Rack contains no noise sources
3.2.5.3A	6.4.3.4A	3.12.3.4A	Lighting Design - Specularity	✓	See ICD	HRF	
3.2.5.3B	6.4.3.4B	3.12.3.4B	Lighting Design - Levels	✓	See ICD	HRF	
3.2.5.3C	6.4.3.4C	3.12.3.4C	Lighting Design - Dimmable	N/A			HRF MARES Rack has no light sources
3.2.5.3D	6.4.3.4D	3.12.3.4D	Lighting Design - Brightness Ratio	N/A			HRF MARES Rack has no glovebox
3.2.5.3E	6.4.3.4E	3.12.3.4E	Lighting Design - Utilize ISS Portable Utility Light (PUL)	N/A			PUL no longer available
3.2.7.1.1A	6.1.1.1A	3.1.1.1A	GSE Interface - Rack Insertion Device	✓	See ICD	HRF	
3.2.7.1.1B	6.1.1.1B	3.1.1.1B	GSE Interface - Rack Shipping Container	✓	See ICD	HRF	
3.2.7.1.1C	6.1.1.1C	3.1.1.1C	GSE Interface - Rack Handling Adapter	✓	See ICD	HRF	
3.2.7.1.1D	6.1.1.1D	3.1.1.1D	GSE Interface - Acceleration	✓	See ICD	HRF	
3.2.7.1.2.1A	6.1.1.2A	3.1.1.2A	MPLM Interface - Attach Points	✓	See ICD	HRF	
3.2.7.1.2.1B	6.1.1.2C	3.1.1.2E	MPLM Interface - Loads	✓	See ICD	HRF	
3.2.7.1.3A	6.1.1.4E	3.1.1.4E	Keep-out Zone	✓	See ICD	HRF	
3.2.7.1.3B	6.1.1.4F	3.1.1.4I	Rack Rotation	✓	See ICD	HRF	
3.2.7.1.3C	6.1.1.4I	3.1.1.4L	Restraints during Rotation	✓	See ICD	HRF	
3.2.7.1.4.1	6.1.1.6.1	3.1.1.6.1	Connector Physical Mate	✓	See ICD	HRF	
3.2.7.1.4.2	6.1.1.6.2	3.1.1.6.2	Umbilical Physical Mate	✓	See ICD	HRF	
3.2.7.2.1.1	6.1.2.1	3.2.1.1.1	Steady-State Voltage - Interface B	✓	See ICD	HRF	
3.2.7.2.1.2	6.1.2.1	3.2.1.1.2	Steady-State Voltage - Interface C	✓	See ICD	HRF	
3.2.7.2.2.1	6.1.2.2.1	3.2.1.2.1	Ripple Voltage/Noise Characteristics - Peak to Peak	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

RED, STRIKETHROUGH		LEGEND					
DELETIONS		ADDITIONS, CHANGES					
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.2.7.2.2.2	6.1.2.2.2	3.2.1.2.2	Ripple Voltage/Noise Characteristics - Spectrum	✓	See ICD	HRF	
3.2.7.2.3.1	6.1.2.3	3.2.1.3.1	Transient Voltages - Interface B	✓	See ICD	HRF	
3.2.7.2.3.2	6.1.2.3	3.2.1.3.2	Transient Voltages - Interface C	✓	See ICD	HRF	
3.2.7.2.4	6.1.2.4	3.2.1.3.3	Fault Clearing and Protection	✓	See ICD	HRF	
3.2.7.2.5A	6.1.2.5A	3.2.1.3.4A	Non-Normal Voltage Range - Overvoltage	✓	See ICD	HRF	
3.2.7.2.5B	6.1.2.5B	3.2.1.3.4B	Non-Normal Voltage Range - Undervoltage	✓	See ICD	HRF	
3.2.7.2.6B	6.1.2.7B	3.2.2.1B	UIP and UOP Connectors and Pin Assignments - UIP Pin-out	✓	See ICD	HRF	
3.2.7.2.6C	6.1.2.7C	3.2.2.1C	UIP and UOP Connectors and Pin Assignments - UIP Connectors	✓	See ICD	HRF	
3.2.7.2.6E		3.2.2.1E	UIP and UOP Connectors and Pin Assignments - UOP Pin-out	✓	See ICD	HRF	
3.2.7.2.6F		3.2.2.1F	UIP and UOP Connectors and Pin Assignments - UOP Connectors	✓	See ICD	HRF	
3.2.7.2.7A	6.1.2.8A	3.2.2.2A	Power Bus Isolation - Single Failure	✓	See ICD	HRF	
3.2.7.2.7B	6.1.2.8B	3.2.2.2B	Power Bus Isolation - Use of Diodes	✓	See ICD	HRF	
3.2.7.2.8	6.1.2.9	3.2.2.3	Compatibility with Soft Start/Stop RPC	✓	See ICD	HRF	
3.2.7.2.9	6.1.2.10	3.2.2.4	Surge Current	✓	See ICD	HRF	
3.2.7.2.10		3.2.2.5	Reverse Energy/Current	✓	See ICD	HRF	
3.2.7.2.11A		3.2.2.6.1.1A	Remote Power Controllers - Interface B & C	✓	See ICD	HRF	
3.2.7.2.11B		3.2.2.6.1.1D	Remote Power Controllers - Overcurrent Protection	✓	See ICD	HRF	
3.2.7.2.11C		3.2.2.6.1.1E	Remote Power Controllers - Overcurrent Protection Interface B	✓	See ICD	HRF	
3.2.7.2.11D		3.2.2.6.2.1.1	Remote Power Controllers - Trip Rating	✓	See ICD	HRF	
3.2.7.2.11E		3.2.2.6.1.1C	Remote Power Controllers - UOP	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

LEGEND							
RED, STRIKETHROUGH		DELETIONS		ADDITIONS, CHANGES			
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.2.7.2.12.1A		3.2.2.7.1A	Rack Complex Load Impedances - Interface B (3 kW and 6 kW)	✓	See ICD	HRF	
3.2.7.2.12.1B		3.2.2.7.1B	Rack Complex Load Impedances - Interface B (1.2 kW and 1.44 kW)	✓	See ICD	HRF	
3.2.7.2.12.2		3.2.2.7.2	Rack Complex Load Impedances - Interface C	✓	See ICD	HRF	
3.2.7.2.13		3.2.2.8	Large Signal Stability	✓	See ICD	HRF	
3.2.7.2.15A		3.2.2.10A	Electrical Load-Stand Alone Stability - CS01	✓	See ICD	HRF	
3.2.7.2.15B		3.2.2.10B	Electrical Load-Stand Alone Stability - CS02	✓	See ICD	HRF	
3.2.7.2.15C		3.2.2.10C	Electrical Load-Stand Alone Stability - CS06	✓	See ICD	HRF	
3.2.7.2.16A	6.1.2.17A	3.2.3.1B	Wire Derating - Derating	✓	See ICD	HRF	
3.2.7.2.16B	6.1.2.17B	3.2.3.1C	Wire Derating - AWG	✓	See ICD	HRF	
3.2.7.2.16C		3.2.3.1A	Wire Derating - UOP	✓	See ICD	HRF	
3.2.7.2.17A	6.1.2.18A	3.2.3.2A	Exclusive Power Feeds - UIP	✓	See ICD	HRF	
3.2.7.2.17B	6.1.2.18B	3.2.3.2B	Exclusive Power Feeds - Cabling	✓	See ICD	HRF	
3.2.7.2.18	6.1.2.19	3.2.3.3	Loss of Power	✓	See ICD	HRF	
3.2.7.2.19	6.1.2.20	3.2.4	Electromagnetic Compatibility (EMC)	✓	See ICD	HRF	
3.2.7.2.19.1	6.1.2.20.1	3.2.4.1	Electrical Grounding	✓	See ICD	HRF	
3.2.7.2.19.2	6.1.2.20.2	3.2.4.2	Electrical Bonding	✓	See ICD	HRF	
3.2.7.2.19.3	6.1.2.20.3	3.2.4.3	Cable/Wire Design and Control Requirements	✓	See ICD	HRF	
3.2.7.2.19.4A	6.1.2.20.4	3.2.4.4	Electromagnetic Interference	✓	See ICD	HRF	
3.2.7.2.19.4B	6.1.2.20.4	3.2.4.4	Electromagnetic Interference - Alternative Use of RS03PL	✓	See ICD	HRF	
3.2.7.2.19.5	6.1.2.20.5	3.2.4.6	AC Magnetic Fields	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

RED, STRIKETHROUGH BOLD		LEGEND DELETIONS ADDITIONS, CHANGES					
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.2.7.2.19.6	6.1.2.20.6	3.2.4.7	DC Magnetic Fields	✓	See ICD	HRF	
3.2.7.2.20	6.1.2.21	3.2.4.5	Electrostatic Discharge	✓	See ICD	HRF	
3.2.7.2.21	6.1.2.22	3.2.4.8	Corona	✓	See ICD	HRF	
3.2.7.2.22	6.1.2.23	3.2.4.9	Lightning	✓	See ICD	HRF	
3.2.7.3.1	6.1.3.1	3.3.2	Word/Byte Notations, Types and Data Transmissions	N/A			No notations, types, or transmissions in HRF MARES Rack
3.2.7.3.2	6.1.3.2	3.3.4	Consultative Committee for Space Data Systems (CCSDS)	N/A			No CCSDS data in HRF MARES Rack
3.2.7.3.3	6.1.3.3	3.3.5	MIL-STD-1553B Low Rate Data Link (LRDL)	N/A			No LRDL interfaces in HRF MARES Rack
3.2.7.3.4	6.1.3.4	3.3.6	Medium Rate Data Link (MRDL)	N/A			No MRDL interfaces in HRF MARES Rack
3.2.7.3.5	6.1.3.5	3.3.7	High Rate Data Link (HRDL)	N/A			No HRDL interfaces in HRF MARES Rack
3.2.7.3.6.1A	6.1.3.6.1A	3.3.10.1A	Rack Maintenance Switch Interfaces - Characteristics	✓	See ICD	HRF	
3.2.7.3.6.1B	6.1.3.6.1B	3.3.10.1B	Rack Maintenance Switch Interfaces - Lever-lock switch	✓	See ICD	HRF	
3.2.7.3.6.2	6.1.3.6.2	3.3.10.2	Smoke Detector Interfaces	N/A			No smoke detector in HRF MARES Rack
3.2.7.3.6.3A	6.1.3.6.3A	3.3.10.3A	Rack Maintenance Switch/Fire Detection Support Interface Connector - J43	✓	See ICD	HRF	
3.2.7.3.6.3B	6.1.3.6.3B	3.3.10.3B	Rack Maintenance Switch/Fire Detection Support Interface Connector - Pin-out	✓	See ICD	HRF	
3.2.7.3.6.3C	6.1.3.6.3C	3.3.10.3C	Rack Maintenance Switch/Fire Detection Support Interface Connector - P43	✓	See ICD	HRF	
3.2.7.4	6.1.4	3.4	Payload National Television Standards Committee (NTSC) Video Interface	N/A			No video interfaces
3.2.7.5	6.1.5	3.5	Thermal Control Interface	N/A			No thermal control interfaces

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

RED, STRIKETHROUGH		LEGEND						
		DELETIONS			ADDITIONS, CHANGES			
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement		Applicable	Verification Method	Responsibility	Comments
3.2.7.6	6.1.6	3.6	Vacuum System Interface		N/A			No vacuum interfaces
3.2.7.7	6.1.7	3.7	Pressurized Gas Interface		N/A			No pressurized gas interfaces
3.2.7.8	6.1.8	3.8.2	Fluid System Services		N/A			No payload support services interfaces
3.2.7.9.1	6.1.10.1	3.10.1	Fire Prevention		✓	See ICD	HRF	
3.2.7.9.2	6.1.10.2	3.10.2.1-2	Payload Monitoring and Detection Requirements		N/A			No smoke detector or parameter monitoring
3.2.7.9.3.1A-B	6.1.10.2A-B	3.10.3.1A-B	PFE - Small Access Port		N/A			HRF MARES Rack has no PFE ports
3.2.7.9.3.2	6.1.10.3.2	3.10.3.2	Fire Suppression Access Port Accessibility		N/A			HRF MARES Rack has no PFE ports
3.2.7.9.3.3	6.1.10.3.3	3.10.3.3	Fire Suppressant Distribution		N/A			HRF MARES Rack has no PFE ports
3.2.7.9.4A	6.1.10.4A	3.10.4A	Labeling - PFE Port		N/A			HRF MARES Rack has no PFE ports or FDS
3.2.7.9.4B	6.1.10.4B	3.10.4B	Labeling - Fire Detection LED		N/A			HRF MARES Rack has no fire detection LED PFE ports or FDS
3.3.1.1.1	6.1.11.1	3.11.1	Materials and Parts Use and Selection		✓	See ICD	HRF	PSRP Approval
3.3.1.1.2	6.1.11.1.1	3.11.1.1	Commercial Parts		✓	See ICD	HRF	PSRP Approval
3.3.1.1.3A-C	6.1.11.2A-C	3.11.2A-C	Fluids		N/A			No fluids in HRF MARES Rack
3.3.1.1.4	6.1.11.3	3.11.3	Cleanliness		✓	See ICD	HRF	Inspect drawings, TPS
3.3.1.1.5	6.1.11.4	3.11.4	Fungus Resistant Material		✓	See ICD	HRF	Material Cert
3.3.1.2	6.4.9.2	3.12.9.2	Sharp Edges and Corner Protection		✓	See ICD	HRF	PSRP Approval
3.3.1.3	6.4.9.3	3.12.9.3	Holes		✓	See ICD	HRF	No holes in the range of 10-25 mm
3.3.1.4	6.4.9.4	3.12.9.4	Latches		✓	See ICD	HRF	No latches in design

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

RED, STRIKETHROUGH BOLD		LEGEND DELETIONS ADDITIONS, CHANGES					
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.3.1.5	6.4.9.5	3.12.9.5	Screws and Bolts	✓	See ICD	HRF	
3.3.1.6	6.4.9.6	3.12.9.6	Securing Pins	✓	See ICD	HRF	
3.3.1.7	6.4.9.7	3.12.9.7	Levers, Cranks, Hooks, and Controls	✓	See ICD	HRF	
3.3.1.8	6.4.9.8	3.12.9.8	Burrs	✓	See ICD	HRF	
3.3.1.9A	6.4.9.9A	3.12.9.9A-B	Locking Wires - Safety Wires	✓	See ICD	HRF	
3.3.1.9B	6.4.9.9B	3.12.9.9A-B	Locking Wires - Fracture Critical Fasteners	✓	See ICD	HRF	No fracture-critical fasteners must be unfastened on-orbit
3.3.2.1	6.4.7	3.12.7	Equipment Identification	✓	See ICD	HRF	
3.3.5.1	6.1.2.24	3.2.4.10	EMI Susceptibility for Safety-Critical Circuits	✗ N/A			No safety-critical circuits
3.3.5.2.1	6.1.2.25.1	3.2.5.1.1	Mating/Demating of Powered Connectors	✓	See ICD	HRF	
3.3.5.2.2	6.1.2.25.2	3.2.5.1.2	Safety-Critical Circuits Redundancy	✗ N/A			No safety-critical circuits
3.3.5.2.3	6.1.2.25.3	3.2.5.2	Rack Maintenance Switch (Rack Power Switch)	✓	See ICD	HRF	
3.3.5.2.4A	6.1.2.25.4A	3.2.5.3A	Power Switches/Controls - Open Supply Circuit Conductors	✓	See ICD	HRF	
3.3.5.2.4B	6.1.2.25.4B	3.2.5.3B	Power Switches/Controls - Power-off Markings/Indications	✓	See ICD	HRF	
3.3.5.2.4C	6.1.2.25.4C	3.2.5.3C	Power Switches/Controls - Supply Circuit not Completely Disconnected	N/A			No standby mode
3.3.5.2.5A	6.3.2.10.5B	3.2.5.5A	Portable Equipment/Power Cords - Three-wire power cord	✓	See ICD	HRF	
3.3.5.2.5B	6.3.2.10.5B	3.2.5.5B	Portable Equipment/Power Cords - Fault current	N/A			No credible fault path to crew
3.3.6.1	6.4.3.1.1	3.12.3.1.1	Closures or Covers Design Requirements	N/A			HRF MARES Rack designed for routine cleaning
3.3.6.2		3.12.8	Color	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

RED, STRIKETHROUGH		LEGEND					
		DELETIONS		ADDITIONS, CHANGES			
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.3.6.3	6.4.2.3	3.12.2.3	Full Size Range Accommodation	✓	See ICD	HRF	
3.3.6.4A	6.4.1.1A	3.12.1A1	Grip Strength	✓	See ICD	HRF	
3.3.6.4B	6.4.1.1B	3.12.1A2	Linear Forces	✓	See ICD	HRF	
3.3.6.4C	6.4.1.1C	3.12.1A3	Torque	✓	See ICD	HRF	
3.3.6.5	6.4.1.2	3.12.1B	Maintenance Operations	✓	See ICD	HRF	
3.3.6.6	6.4.2.1	3.12.2.1	Adequate Clearance	✓	See ICD	HRF	
3.3.6.7A	6.4.2.2A	3.12.2.2A	Accessibility - Geometric Arrangement	✓	See ICD	HRF	
3.3.6.7B	6.4.2.2B	3.12.2.2B	Accessibility - Access Openings for Fingers	✓	See ICD	HRF	
3.3.6.8	6.4.3.1.3	3.12.3.1.5	One-Handed Operation	N/A			No cleaning supplies for HRF MARES Rack
3.3.6.9	6.4.3.2.1	3.12.3.2.1	Continuous/Incidental Contact - High Temperature	✓	See ICD	HRF	
3.3.6.10	6.4.3.2.2	3.12.3.2.2	Continuous/Incidental Contact - Low Temperature	N/A			HRF MARES Rack serves no cooling functions.
3.3.6.11	6.4.4.2.1	3.12.4.2.1	Equipment Mounting	✓	See ICD	HRF	
3.3.6.12A-B	6.4.4.2.2A-B	3.12.4.2.2	Drawers and Hinged Panels	N/A			HRF MARES Rack has no ORUs for routine checkout.
3.3.6.13	6.4.4.2.3	3.12.4.2.5	Alignment	✓	See ICD	HRF	
3.3.6.14	6.4.4.2.4	3.12.4.2.6	Slide-Out Stops	✓	See ICD	HRF	
3.3.6.15	6.4.4.2.5	3.12.4.2.7	Push-Pull Force	✓	See ICD	HRF	
3.3.6.16A-B	6.4.4.2.6.1A-B	3.12.4.2.8.1A-B	Covers - sliding or hinged cap or door	N/A			No physical access required
3.3.6.17	6.4.4.2.6.2	3.12.4.2.8.2	Self-Supporting Covers	N/A			No physical access required
3.3.6.18	6.4.4.3.2A	3.12.4.3.2A1	Accessibility	✓	See ICD	HRF	
3.3.6.19A	6.4.4.3.3A	3.12.4.3.3A	Ease of Disconnect - Nominal Operations	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

RED, STRIKETHROUGH		LEGEND					
		DELETIONS		ADDITIONS, CHANGES			
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verificati on Method	Responsibility	Comments
3.3.6.19B	6.4.4.3.3B	3.12.4.3.3B	Ease of Disconnect - ORU Replacement Operations	✓	See ICD	HRF	
3.3.6.20	6.4.4.3.4	3.12.4.3.4	Indication of Pressure/Flow	N/A			No fluids
3.3.6.21	6.4.4.3.5	3.12.4.3.5	Self Locking	✓	See ICD	HRF	
3.3.6.22A	6.4.4.3.6A	3.12.4.3.6A	Connector Arrangement - Space between Connectors and Adjacent Obstructions	✓	See ICD	HRF	
3.3.6.22B	6.4.4.3.6B	3.12.4.3.6B	Connector Arrangement - Space between Connectors in a Row	✓	See ICD	HRF	
3.3.6.23	6.4.4.3.7	3.12.4.3.7	Arc Containment	✓	See ICD	HRF	
3.3.6.24	6.4.4.3.8	3.12.4.3.8	Connector Protection	✓	See ICD	HRF	
3.3.6.25	6.4.4.3.9	3.12.4.3.9	Connector Shape	✓	See ICD	HRF	
3.3.6.26	6.4.4.3.10	3.12.4.3.10	Fluid and Gas Line Connectors	N/A			No fluid/gas lines
3.3.6.27	6.4.4.3.11A	3.12.4.3.11A	Alignment Marks or Guide Pins	✓	See ICD	HRF	
3.3.6.28A	6.4.4.3.12A	3.12.4.3.12A	Coding - Unique to Connection	✓	See ICD	HRF	
3.3.6.28B	6.4.4.3.12B	3.12.4.3.12B	Coding - Visible	✓	See ICD	HRF	
3.3.6.29	6.4.4.3.13	3.12.4.3.13	Pin Identification	✓	See ICD	HRF	
3.3.6.30	6.4.4.3.14	3.12.4.3.14	Orientation	✓	See ICD	HRF	
3.3.6.31A	6.4.4.3.15A	3.12.4.3.15A	Hose/Cable Restraints - Loose Ends	✓	See ICD	HRF	
3.3.6.31B	6.4.4.3.15B	3.12.4.3.15B	Hose/Cable Restraints - Clamps	✓	See ICD	HRF	
3.3.6.31D	6.4.4.3.15D	3.12.4.3.15D	Hose/Cable Restraints - Loose Cables	✓	See ICD	HRF	
3.3.6.32	6.4.4.4.1	3.12.4.4.1	Non-Threaded Fasteners Status Indication	✓	See ICD	HRF	
3.3.6.33	6.4.4.4.2	3.12.4.4.2	Mounting Bolt/Fastener Spacing	✓	See ICD	HRF	
3.3.6.34	6.4.4.4.3	3.12.4.4.4A	Multiple Fasteners	✓	See ICD	HRF	
3.3.6.35	6.4.4.4.4	3.12.4.4.5	Captive Fasteners	✓	See ICD	HRF	
3.3.6.36A	6.4.4.4.5A	3.12.4.4.6A	Quick Release Fasteners - One turn max	✓	See ICD	HRF	
3.3.6.36B	6.4.4.4.5B	3.12.4.4.6B	Quick Release Fasteners - Positive Locking	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

			LEGEND				
RED, STRIKETHROUGH			DELETIONS		ADDITIONS, CHANGES		
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.3.6.37	6.4.4.4.6	3.12.4.4.7	Threaded Fasteners	✓	See ICD	HRF	
3.3.6.38A-C	6.4.4.4.7A-C	3.12.4.4.8A-C	Over Center Latches	N/A			No over-center latches
3.3.6.39	6.4.4.4.8	3.12.4.4.9	Winghead Fasteners	✓ N/A	See ICD	HRF	No winghead fasteners
3.3.6.40A	6.4.4.4.9A	3.12.4.4.11A	Fastener Head Type - On-Orbit Crew Actuation	✓	See ICD	HRF	
3.3.6.40B	6.4.4.4.9B	3.12.4.4.11B	Fastener Head Type - Smooth Surface	✓	See ICD	HRF	
3.3.6.40C	6.4.4.4.9C	3.12.4.4.11C	Fastener Head Type - Slotted Fasteners	✓	See ICD	HRF	
3.3.6.41	6.4.4.4.10	3.12.4.4.12	One-Handed Actuation	✓	See ICD	HRF	
3.3.6.43	6.4.4.4.12	3.12.4.4.14	Access Holes	✓	See ICD	HRF	
3.3.6.44	6.4.5.1	3.12.5.1	Controls Spacing Design Requirements	✓	See ICD	HRF	
3.3.6.45.1A-G	6.4.5.2.1A-G	3.12.5.2.1A-G	Protective Methods	✓	See ICD	HRF	
3.3.6.45.2	6.4.5.2.2	3.12.5.2.2	Noninterference	✓	See ICD	HRF	
3.3.6.45.3	6.4.5.2.3	3.12.5.2.3	Dead-Man Controls	N/A			No dead-man controls
3.3.6.45.4	6.4.5.2.4	3.12.5.2.4	Barrier Guards	✓	See ICD	HRF	
3.3.6.45.5	6.4.5.2.5	3.12.5.2.5	Recessed Switch Protection	N/A			No recessed or rotary switches
3.3.6.46	6.4.5.2.7	3.12.5.2.7	Position Indication	N/A			No covers in design
3.3.6.47	6.4.5.2.8	3.12.5.2.8	Hidden Controls	N/A			No hidden controls
3.3.6.48	6.4.5.2.9	3.12.5.2.9	Hand Controllers	N/A			No hand controllers
3.3.6.49A-E	6.4.5.3A-E	3.12.5.3A-E	Valve Controls	N/A			No valves in design
3.3.6.50	6.4.5.4	3.12.5.4	Toggle Switches	✓	See ICD	HRF	
3.3.6.51	6.4.6	3.12.6	Restraints and Mobility Aids	✓	See ICD	HRF	
3.3.6.51.1A	6.4.6.1A	3.12.6.1A	Stowage Drawer Contents - Restraints	✓	See ICD	HRF	
3.3.6.51.1B	6.4.6.1B	3.12.6.1B	Stowage Drawer Contents - Restraints	✓	See ICD	HRF	
3.3.6.51.1C	6.4.6.1C	3.12.6.1C	Stowage Drawer Contents - Restraints	✓	See ICD	HRF	
3.3.6.51.2A	6.4.6.2A	3.12.6.2A	Stowage and Equipment Drawers/Trays	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

RED, STRIKETHROUGH		LEGEND					
DELTECTIONS		ADDITIONS, CHANGES					
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.3.6.51.2B	6.4.6.2B	3.12.6.2B	Stowage and Equipment Drawers/Trays	✓	See ICD	HRF	
3.3.6.51.3	6.4.6.3	3.12.6.3	Captive Parts	✓	See ICD	HRF	
3.3.6.51.4.1	6.4.6.4.1	3.12.6.4.1	Handles and Restraints	N/A			All portable equipment can be grasped with one hand
3.3.6.51.4.2	6.4.6.4.2	3.12.6.4.3	Handle Location/Front Access	✓ N/A	See ICD	HRF	No handles in design
3.3.6.51.4.3	6.4.6.4.3	3.12.6.4.4	Handle Dimensions	✓ N/A	See ICD	HRF	No handles in design
3.3.6.51.4.4A-C	6.4.6.4.4A-C	3.12.6.4.5A-C	Non-Fixed Handles Design Requirements - Stop Position	N/A			No non-fixed handles
3.3.6.52B	6.4.9.1B	3.12.9.1B	Electrical Hazards - Exposure hazard exceeds threshold for shock	✓	See ICD	HRF	
3.3.6.52C	6.4.9.1C	3.12.9.1C	Electrical Hazards - Exposure hazard exceeds threshold for shock and threshold of let-go profile	✓	See ICD	HRF	
3.3.6.52D	6.4.9.1D	3.12.9.1D	Electrical Hazards - Two dependent controls provided	✓	See ICD	HRF	
3.3.6.52E	6.4.9.1E	3.12.9.1E	Electrical Hazards - Three independent hazard controls	✓	See ICD	HRF	
3.3.6.52.1A	6.4.9.1.1A	3.12.9.1.1	Mismatched - Reversed Connection	✓	See ICD	HRF	
3.3.6.52.1B	6.4.9.1.1B	3.12.9.1.1	Mismatched - Blind Connections	✓	See ICD	HRF	
3.3.6.52.1C	6.4.9.1.1C	3.12.9.1.1	Mismatched - Mismating	✓	See ICD	HRF	
3.3.6.52.1D	6.4.9.1.1D	3.12.9.1.1	Mismatched - Minimizing Equipment Risk	✓	See ICD	HRF	
3.3.6.52.2.1	6.4.9.1.2.1	3.12.9.1.4.1	Device Accessibility	✓	See ICD	HRF	
3.3.6.52.2.2	6.4.9.1.2.2	3.12.9.1.4.2	Extractor-Type Fuse Holder	✓ N/A	See ICD	HRF	No extractor-type fuse holders in design
3.3.6.52.2.3	6.4.9.1.2.3	3.12.9.1.4.3	Overload Protection Location	✓	See ICD	HRF	
3.3.6.52.2.4	6.4.9.1.2.4	3.12.9.1.4.4	Overload Protection Identification	✓	See ICD	HRF	
3.3.6.52.2.5	6.4.9.1.2.5	3.12.9.1.4.5	Automatic Restart Protection	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

			LEGEND				
RED, STRIKETHROUGH			DELETIONS		ADDITIONS, CHANGES		
HRD Section	LS-71000 Section	SSP 57000 Section	Requirement	Applicable	Verification Method	Responsibility	Comments
3.3.6.53	6.4.9.10	3.12.9.10	Audio Displays	N/A			No audio displays
3.3.6.54	6.4.9.11	3.12.9.12	Egress	✓	See ICD	HRF	
3.3.8.1.1A	6.1.1.3B	3.1.1.3B	Structural Design Requirements - Positive Safety Margins for On-orbit Loads	✓	See ICD	HRF	
3.3.8.1.1B	6.1.1.3D	3.1.1.3D	Structural Design Requirements - Crew Induced Load Requirements	✓	See ICD	HRF	
3.3.8.1.2	6.1.1.5	3.1.1.5A	Safety-Critical Structures Requirements	✓	See ICD	HRF	
3.3.8.1.3	6.1.1.4C	3.1.1.4C	Modal Frequency	✓	See ICD	HRF	
3.3.8.1.4A	6.1.1.3A	3.1.1.3A	Launch and Landing Loads - Margins of Safety	✓	See ICD	HRF	
3.3.8.1.4B	6.1.1.3E	3.1.1.3E	Launch and Landing Loads - Random Vibration	✓	See ICD	HRF	
3.3.8.1.4C	6.1.1.3F	3.1.1.3F	Launch and Landing Loads - Load Factors	✓	See ICD	HRF	

✓ - Requirement is applicable

E - Exception

N/A - Requirement is not applicable

LEGEND

RED, STRIKETHROUGH
BOLD

DELETIONS
ADDITIONS, CHANGES

APPENDIX C

FUNCTIONAL PERFORMANCE VERIFICATION MATRIX

RED, STRIKETHROUGH	DELETIONS
BOLD	ADDITIONS, CHANGES

APPENDIX C

FUNCTIONAL PERFORMANCE VERIFICATION MATRIX

HRD Section	LS-71000 Section	Requirement	Applicable	Verification Method	Comments
3.2.1.1A		Attach to existing ISS hardware without modification.	✓	I, T	Inspect Drawings, Fit Check
3.2.1.1B		Have minimal activities required to attach the MARES Main Box and VIF.	✓	I, D	Inspect Drawings, Demonstrate attachment activities
3.2.1.1C		Functional Performance Characteristics Provide stowage capability for all MARES hardware.	✓	A, D	Demonstrate MARES use in deployed configuration
3.2.1.1D		Provide interface to attach the MARES to either the UIP or the SUP/UOP.	✓	T	Perform interface test with as-built cables
3.2.3A	7.2	Reliability, Quality, and Non-Conformance Reporting	✓	I	TPS, Discrepancy Report (DR), Failure Investigation Analysis Report (FIAR) System in place
3.2.3B	7.3.1	Reliability, Quality, and Non-Conformance Reporting	✓	A, I	TPS, DR, FIAR System in place
3.2.3.C1	7.3.2.1	Reliability, Quality, and Non-Conformance Reporting	✓	A, I	TPS, DR, FIAR System in place
3.2.3.C2	7.3.2.2	Reliability, Quality, and Non-Conformance Reporting	✓	A, I	TPS, DR, FIAR System in place
3.2.3.C3	7.3.2.3	Reliability, Quality, and Non-Conformance Reporting	✓	A, I	TPS, DR, FIAR System in place
3.2.3.C4	7.3.2.4	Reliability, Quality, and Non-Conformance Reporting	N/A	I/N/A	No software
3.2.3.1		Failure Propagation	✓	I, A	
3.2.3.2	3.1.1, 7.2.1	Useful Life	✓	A	Review Failure Modes and Effects Analysis (FMEA), LLIL
3.2.3.2.1		Operational Life (Cycles)	✓	A	Review FMEA, LLIL
3.2.3.2.2		Shelf Life	✓	A	Review ADP, GCAR
3.2.3.2.3		Limited Life	✓	A	
3.2.6.1		Launch and Landing	N/A	N/A	Launch and landing requirements directly imposed by SSP 57000.
3.2.7.2.11.1A		HRF MARES Rack Trip Requirements Summary	✓	A	

✓ - Requirement is applicable

I - Inspection

E - Exception

D - Demonstration

N/A - Requirement is not applicable

A - Analysis

T - Test

RED, STRIKETHROUGH BOLD		LEGEND			
		DELETIONS	ADDITIONS, CHANGES		
HRD Section	LS-71000 Section	Requirement	Applicable	Verification Method	Comments
3.2.7.2.11.1B		HRF MARES Rack Trip Requirements Summary	✓	A	
3.2.7.2.11.1C		HRF MARES Rack Trip Requirements Summary	✓	A	
3.2.7.10.1		HRF MARES Rack to MARES Interface Requirements	✓	T, I, A	Review drawings, perform integration test
3.3.1.1.1.1A		Russian Materials Usage Agreement	✓	A	Review Material Cert
3.3.1.1.1.1B		Russian Materials Usage Agreement	✓	I	Inspect drawings
3.3.1.9C		Locking Wires	✓	A	Payload Safety Review Panel
3.3.3	7.3.1	Workmanship	✓	I	Inspection at assembly, release of drawings
3.3.6.2.1A	6.4.3.5.1	Interior Color - Rack Mounted Equipment - Front Panel Color	✓	I	HRF ED-001A, inspect drawings
3.3.6.2.1B	6.4.3.5.1	Interior Color - Rack Mounted Equipment - Front Panel Finish	✓	I	HRF ED-001A, inspect drawings
3.3.6.2.1C	6.4.3.5.1	Interior Color - Rack Mounted Equipment - Latches	N/A	IN/A	HRF MARES Rack is not rack mounted equipment
3.3.6.2.2A	6.4.3.5.2A	Interior Color - Stowed/Deployable Equipment - COTS	✓	I	HRF ED-001A, inspect drawings
3.3.6.2.2B	6.4.3.5.2B	Interior Color - Stowed/Deployable Equipment - Repackaged	✓	I	HRF ED-001A, inspect drawings
3.3.6.2.3	6.4.3.5.3	Soft Goods - Color	✗	I	HRF ED-001A, inspect drawings
3.3.8.2.1	6.2.2.14	Batteries	N/A	N/A	HRF MARES Rack contains no batteries.

NOTE: Fill in rows for Section 3.2.7.3.6 per LS-71020 Appendix A.

✓ - Requirement is applicable
I - Inspection

E - Exception
D - Demonstration

N/A - Requirement is not applicable
A - Analysis

T - Test

LEGEND

RED, STRIKETHROUGH
BOLD

DELETIONS
ADDITIONS, CHANGES

APPENDIX D

**ACCEPTANCE AND QUALIFICATION TEST APPLICABILITY
MATRIX AND REQUIREMENTS**

RED, STRIKETHROUGH
BOLD

LEGEND
DELETIONS
ADDITIONS, CHANGES

TABLE D-1. ACCEPTANCE AND QUALIFICATION TEST APPLICABILITY MATRIX

HRD Section	HRD Verification Section	LS-71000 Section	Requirement	Applicable	Comments
3.4.1A	4.3.1.1, 4.3.1.2	5.4.1.1.6.1 and 5.4.1.1.6.2	Thermal Environment Compatibility	✓	
3.4.1B	4.3.1.1, 4.3.1.2	5.4.1.1.6.1 and 5.4.1.1.6.2	Thermal Environment Compatibility	✓	
3.4.2	4.3.2		Vibration and Sine Sweep	✓	HRF will accept the risk of not performing acceptance vibration testing on the MARES Rack stowage drawer and the MARES Rack. No substitute verification method will be used to replace acceptance vibration testing for the MARES Rack stowage drawer and the MARES Rack.
3.4.3	4.3.3	5.4.1.3.4	Functional Acceptance	✓	
3.4.4	4.3.4	5.4.1.1.10	EEE Parts Control, Selection, and Burn-in	✓	
3.4.5	4.3.5	5.4.1.1.8	Flammability	✓	
3.4.6	4.3.6	5.4.1.1.9	Offgassing	✓	
3.4.7	4.3.7	5.4.1.1.4	Shock	N/A	Not rack mounted equipment
3.4.8	4.3.8	5.4.1.1.5	Bench Handling	✓	Drop test for PIP only
3.4.9	4.3.9	5.4.1.1.1	Payload Mass	✓	
3.4.10	4.3.10	5.4.1.2.1	Electromagnetic Compatibility	✓	
3.4.11	4.3.11	5.4.1.1.7	Acoustic Noise	N/A	
3.4.12.1	4.3.12.1	5.4.1.1.11.1	Safety-Critical Structure Dimensional Check	✓	
3.4.12.2	4.3.12.2	5.4.1.1.11.2	Safety-Critical Structure Material Certification	✓	
3.4.13	4.3.13	5.4.1.3.1	Software Acceptance	N/A	No software
3.4.14	4.3.14	5.4.1.3.2	Pre-Delivery Acceptance	✓	

RED, STRIKETHROUGH		LEGEND			
BOLD		DELETIONS		ADDITIONS, CHANGES	
HRD Section	HRD Verification Section	LS-71000 Section	Requirement	Applicable	Comments
3.4.15	4.3.15	5.4.1.3.3	Pre-Installation	✓	

RED, STRIKETHROUGH
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LEGEND
DELETIONS
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TABLE D-2. Non-Critical Hardware Qualification Test Requirements

Type Test Component	Example Electroni c Equipme nt	Example Mechanica l Equipment	Example Battery	HRF MARES Rack Structure	PIP	Cables	Kits	Part Number Stowage Drawer
Thermal Cycling 7.5 Cycles	✗	✗	✗	✗ N/A	✓	N/A	N/A	N/A
Qualification for Acceptance Vibration	✗	✗	✗	N/A	✓	N/A	N/A	N/A
Flammability	✗	✗	✗	✓	✓	✓	✓	✓
Offgassing	✗	✗	✗	✓	✓	✓	✓	✓
Bench Handling	✗	✗	✗	✗ N/A (PIP only)	✓	N/A	N/A	N/A
Payload Mass Control Plan	✗	✗	✗	✓	✓	✓	✓	✓
EMI/EMC Control Plan	✗		✗	✗ N/A	✓	✓	N/A	N/A
Acoustic Noise Control Plan	✗	✗		N/A	N/A	N/A	N/A	N/A
Sinusoidal Resonance Analysis				✓	N/A	N/A	N/A	✓
EEE Parts Screening	✗	✗	✗	✗				
EEE Parts Control	✗	✗	✗	✗				

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DELETIONS
ADDITIONS, CHANGES

TABLE D-3. NON-CRITICAL HARDWARE ACCEPTANCE TEST REQUIREMENTS

Type Test Component	Example Electronic Equipment	Example Mechanica l Equipment	Example Battery	HRF MARES Rack Structure	PIP	Cables	Kits	Part Number Stowage Drawer
Thermal Cycling 1½ Cycles	✗	✗	✗	✗ N/A	✓	N/A	N/A	N/A
Acceptance Vibration	✗	✗	✗	N/AE	✓	N/A	N/A	E
Functional	✗	✗	✗	✓	✓	✓	✓	✓
Burn-in	✗	✗	✗	✗ N/A	✓	N/A	N/A	N/A
Pre-Delivery Acceptance Functional	✗	✗	✗	✓	✓	✓	✓	✓